

REMARKS

Present Status of the Application

The Office Action mailed August 13, 2001, rejected all claims 1-5. Specifically, the Office Action rejected claims 2-5 under 35 U.S.C. 112, first paragraph, as containing subject matter, which was not described in the specification. The Office Action also rejected claims 2-5 under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter. In addition, The Office Action rejected claim 1 under 35 U.S.C. 103(a) as being unpatentable over Yu (U.S. Pat. No. 5,553,663). The Office Action also objected to the specification. Applicants have amended specification and claims 1-5. No new matter adds by way of these amendments. After entry of the foregoing amendments, claims 1-5 remain pending in the present application.

Discussion of Office Action Rejections

The specification was objected to because the formula in page 3 and 6 is not complete for lacking an operator sign. Applicants have amended the specification to add the proper operator sign to overcome the objection.

In addition, the Office Action objected to the specification under 37 CFR 1.71 because in the newly amendments, it is not understood how the slits 51, 52 and 55, 56 are partitioned by the partitioned positions 5 and 6. The Office Action stated that it is not clear whether at the partitioned positions 5 and 6, the Applicants cut one slit into two slits or else. In response, Applicants use the word "partition" to represent that the slits 51/52 (and 55/56) are formed by dividing one slit at position 5 (or 6). Thus, the portion 5 (or 6) between slits 51 and 52 and between slits 55 and 56 is not cut away from the fin. In the amended specification filed on June

26, 2001, it states that "in Fig. 5, the partition positions 5, 6 are represented by dash lines. Namely, slits 51, 52 and 55, 56 are partitioned from one slit at the positions 5 and 6 respectfully". Applicants respectfully submit that the meaning of the above description is clear and is fully supported by the original specification (See Fig. 1). Withdrawal of the objection is requested.

Furthermore, the Office Action objected to the specification under 37 CFR 1.75(d)(1) and MPEP 608.01(o) as failing to provide proper antecedent basis for the claimed subject matter. The Office Action stated that the limitation "a cut profile (at the positioned position) between the two slits in different lengths is parallel to the air flow" in claims 2-5 are not described in the specification.

Applicant respectfully disagrees. Figs. 1 and 5 show that the air flow depicted by the arrow labeled with "Air" is parallel to the cut profiles (at the partitioned position) of slits 51, 52, 55, and 56. In other words, the cutting edges of the slits 51, 52, 55, and 56 at the partitioned end (adjacent to 5 and 6) are parallel to the flow direction of the air. Therefore, the limitation "a cut profile (at the positioned position) between the two slits in different lengths is parallel to the air flow" in claims 2-5 are supported by the specification, although exactly the same wording are not used in the specification.

Withdrawal of the objection is requested.

The Office Action rejected claims 2-5 under 35 U.S.C. 112, first paragraph, as containing subject matter, which was not described in the specification. The Office Action stated that the limitation "a cut profile (at the positioned position) between the two slits in different lengths is parallel to the air flow" in claims 2-5 are not described in the specification.

For the reasons discussed above, claims 2-5 read on the specification. Withdrawal of the rejection is requested.

Additionally, the Office Action also rejected claims 2-5 under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter. The Office Action stated that this limitation is misdescriptive to the subject matter, which is described in Fig. 5.

Applicants disagree and respectfully submit that this limitation is descriptive for the reasons set forth above. Nevertheless, Applicants have amended claims 2-5 to further clarify the claim language.

Turning now to the substantive rejection.

Claim 1 is rejected under 35 U.S.C. 103(a) as being unpatentable over Yu. The Examiner states that Yu discloses a heater exchanger structure same as the claimed invention, and also a geometric relationship within the formula as claimed in the invention.

First, the Office Action alleged that based on the geometric relationship within the figure 6, the ratio between the width of the slit (W_s) and the width of the fin (W_r) is $1/16$. Although Yu fails to teach the variable number, but it is inherent to know that the longer the fin, the more number of slit array formed on the fin. The Office Action deemed that it is an obvious design of choice to choose the number of slit arrays per the fin etc.

Applicants respectfully disagree with the Examiner's interpretation and traverse the rejections for reasons set forth below.

Throughout the Yu's disclosure, nothing about the geometric relationship has been clearly defined (cols. 1~6). Yu's main point is concerning about the X-shape strip configuration.

Clearly, Yu fails to definitely disclose the geometrical relationship defined by the claimed formula in claim 1 of the invention. Within the recited formula, the heat exchanger of the present invention can achieve an 'unexpected result' as shown in Figs. 2A and 2B, which is not disclosed, suggested or taught in the Yu reference and, certainly, is not an obvious matter of design choice. Even if it is obvious to try with different number of slit arrays with different width of slits, obvious to try is not the test for patentability:

"Obvious to experiment is not a proper standard for obviousness. '[S]elective hindsight is not more applicable to the design of experiments than it is to the combination of prior art teachings. There must be a reason or suggestion in the art for selecting the procedure used, other than the knowledge learned from the applicant's disclosure.'" In re O'Farrell, 853 F.2d 894, 7 USPQ2d 1673 (Fed. Cir. 1988).

For the reasons discussed above, claim 1 is patentable over Yu.

Nevertheless, Applicants have amended claim 1 to further define the present invention. In the amended claim 1, it is specified that N is equal to or less than 6. As described on page 6, line 15-16, the formula, $W_s \geq (1-0.1 (6-N)) \times W_f / (2N+1)$, is for a heat transfer fin configuration of six slit arrays (rows) or less per heat transfer fin unit, that is $N \leq 6$. When $N=6$, $W_s/W_f = 1/13$; when $N=1$, $W_s/W_f = 1/6$. The Examiner indicated that, based on Fig. 6, the ratio between the width of split (W_s) and the width of the fin (W_f) is $1/16$ (Applicants do not necessarily agree with the interpretation of Yu by the Examiner in this regard). Thus, $W_s/W_f < (1-0.1 (6-N)) \times W_f / (2N+1)$ in Yu. Even according to Examiner's calculation, Yu does not satisfy the formula of claim 1.

For at least the reasons set out above, Applicants respectfully submit that Yu fails to disclose, suggest or teach every claimed subject feature in claim 1, and claim 1 patently define over Yu. Applicants respectfully request that the rejection under 35 U.S.C 103 be withdrawn.

Claims 2-5 are believed to comply with the requirements of 35 USC 112, first and second paragraphs and are patentable over prior art.

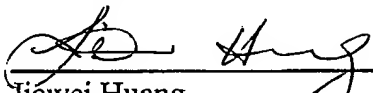
CONCLUSION

For at least the foregoing reasons, it is believe that all pending claims 1-5 are in proper condition for allowance. If the Examiner believes that a conference would be of value in expediting the prosecution of this application, he is hereby invited to telephone the undersigned counsel to arrange for such a conference.

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4 Venture, Suite 250
Irvine, CA 92618
Tel.: (949) 660-0761
Fax: (949)-660-0809

Respectfully submitted,
J.C. PATENTS


Jiawei Huang
Registration No. 43,330

ANNOTATED VERSION OF MODIFIED CLAIMS
TO SHOW CHANGES MADE

In The Specification

The first paragraph on page 3 has been amended as follow:

A heat exchanger characterized as follows is provided to achieve the aforementioned objective. As claimed in Claim 1 of the present invention, a heat exchanger in which heat transfer coils penetrate through a row of multiple plate-shaped heat transfer fins set at a specified fin pitch and in which air is supplied orthogonally to said heat transfer coils, is configured so as to satisfy the correlation expressed by the following numerical formula:

$$W_s \geq (1 - 0.16(6 - N)) \times W_f / (2N + 1)$$

wherein, W_s = width of a slit, W_f = width of a heat transfer fin, and N = the number of slit arrays / number of heat transfer fin units.

The paragraph begin at line 14 of page 6 has been amended as follows:

The results indicate that the optimum relationship between slit width and slit spacing is one which satisfies the following numerical formula for a heat transfer fin configuration of 6 slits or less per width of one fin array:

$$W_s \geq (1 - 0.16(6 - N)) \times W_f / (2N + 1)$$

In the claims

Claims 1-5 has been amended as follows:

1. (Twice Amended) A heat exchanger in which heat transfer coils penetrate through a row of multiple plate-shaped heat transfer fins set at a specified fin pitch and

in which air is supplied orthogonally to said heat transfer coils, characterized by a configuration so as to satisfy the correlation expressed by the following numerical formula:

$$W_s \geq (1 - 0.1(6 - N)) \times W_f / (2N + 1)$$

where, W_s = width of each slit formed on said heat transfer fins, W_f = width of a heat transfer fin, and N = the number of slit arrays formed on said heat transfer fin / number of heat transfer fin units, and wherein N is equal to or less than 6.

2. (Twice Amended) A heat exchanger in which heat transfer coils penetrate through a row of multiple plate-shaped heat transfer fins set at a specified fin pitch, and slits are formed on each plate-shaped heat transfer fin, and in which air is supplied orthogonally to said heat transfer coils, characterized by a configuration in which a width of each slit formed orthogonal to the air flow on each heat transfer fin is set within a range of 0.17 - 0.29 times a diameter of the heat transfer coils, wherein two slits formed in front of the heat transfer coil and two slits formed behind said heat transfer coil are arranged so there is a mutually different length in a direction perpendicular to the air flow, and wherein a cut profile of each of [between] the two slits formed in front of the heat transfer coil and the two slits formed behind said heat transfer coil [in different lengths] is parallel to the air flow.

3. (Twice Amended) A heat exchanger in which heat transfer coils penetrate through a row of multiple plate-shaped heat transfer fins set at a specified fin pitch, and slits are formed on each plate-shaped heat transfer fin, and in which air is supplied orthogonally to said heat transfer coils, characterized by a configuration in which a spacing between slits formed on the heat

transfer fins is set within a range of 0.18 - 0.5 times the diameter of the heat transfer coils, wherein two slits formed in front of the heat transfer coil and two slits formed behind said heat transfer coil are arranged so there is a mutually different length in a direction perpendicular to the air flow, and wherein a cut profile [between] of each of the two slits formed in front of the heat transfer coil and the two slits formed behind said heat transfer coil [in different lengths] is parallel to the air flow.

4. (Twice Amended) A heat exchanger in which heat transfer coils penetrate through a row of multiple plate-shaped heat transfer fins set at a specified fin pitch, and slits are formed on each plate-shaped heat transfer fin, and in which air is supplied orthogonally to said heat transfer coils, characterized by a configuration in which a width of each slit formed on each heat transfer fin is set within a range of 0.17 - 0.29 times a diameter of the heat transfer coils, and the spacing between slits formed on the heat transfer fins is set within a range of 0.18 - 0.5 times the diameter of the heat transfer coils, wherein two slits formed in front of the heat transfer coil and two slits formed behind said heat transfer coil are arranged so there is a mutually different length in a direction perpendicular to the air flow, and wherein a cut profile [between] of each of the two slits formed in front of the heat transfer coil and the two slits formed behind said heat transfer coil [in different lengths] is parallel to the air flow.

5. (Twice Amended) A heat exchanger in which heat transfer coils penetrate through a row of multiple plate-shaped heat transfer fins set at a specified fin pitch and in which air is supplied orthogonally to said heat transfer coils, characterized by a configuration such that within a plurality of slit arrays formed on a heat transfer fin, for a given slit array a slit formed on either

edge of a heat transfer fin is partitioned into slits of different length, and a position at which the slit is partitioned is staggered on each of the two edges of the heat transfer fin, wherein a cut profile at the partitioned position [between] of each of the two slits formed in front of the heat transfer coil and the two slits formed behind said heat transfer coil [in different lengths] is parallel to the air flow.